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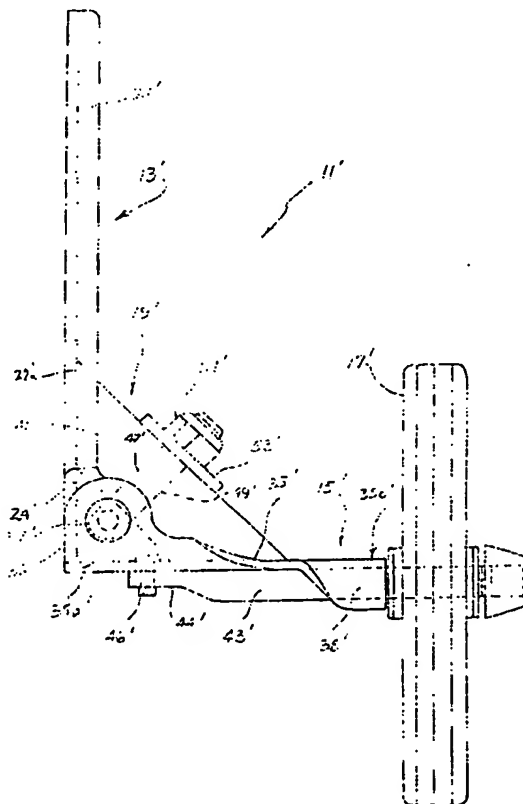
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(54) Title: CUSHIONING MEANS FOR ARTICULATED MEMBERS

(57) Abstract

A cushioning member (19) for articulated members (13, 13', 15 and 15') which resists hinging of the articulated members (13, 13', 15 and 15') together. In one form the cushioning member (19) is applied to trainer wheels (11 and 11') for a bicycle. The cushioning member (19) is compressed by first members (13 and 13') and second members (15 and 15') hinging towards each other. This allows the training wheels (11 and 11') to rise over obstacles such as bumps and the like so as to avoid inexperienced riders being tipped off the bicycle. Typically, the cushioning member (19) is made from rubber or the like compressible material. The resistance force of the cushioning member (19) can be adjusted with a nut (51 and 51') and a bolt (47 and 47').



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TITLECUSHIONING MEANS FOR ARTICULATED MEMBERSFIELD OF THE INVENTION

The present invention relates to a cushioning means for  
5 articulated members particularly, although not exclusively,  
envisaged for use as a shock absorber for vehicle frames.

In the context of the present invention vehicle frames  
includes bicycle frames, training wheels for bicycle frames,  
wheel chair frames, rickshaw frames, vehicle trainer frames,  
10 seats for bicycles, child carrying seats for bicycles, aircraft  
undercarriages and the like.

BACKGROUND OF THE INVENTION

It has been known to use relatively sophisticated device  
for biasing articulated members apart and to provide for  
15 cushioning of one member with respect to another. An example  
of such a device is a vehicle shock absorber which is disposed  
between two articulated members, one being the chassis of the  
vehicle, and the other being an axle to which the wheel of the  
vehicle is attached. The shock absorber is disposed to  
20 maintain the relative positions of the axle and the vehicle and  
to cushion the chassis from vibration transmitted via the axle  
from the wheel.

Shock absorbers are relatively expensive and sophisticated  
and therefore not suited to a large number of vehicle frames,  
25 such as, for example, in bicycles, tricycles, trailers and the  
like.

A particular example of the need for use of a cushioning  
means is in relation to "trainer" wheel for assisting young  
inexperience people to ride bicycles. Trainer wheels of the  
30 prior art type typically have an "L" shaped bracket which is  
disposed outwardly from a rear axle of the bicycle. A wheel  
is located at an outer end of the bracket so as to provide an  
auxiliary wheel, substantially parallel to the main wheels of  
the bicycle, but displaced laterally. The trainer wheels are  
35 disposed slightly above the ground so that when the bicycle is  
ridden in a straight line neither of the trainer wheel touches  
the ground. The trainer wheels have the effect of providing  
added stability to the bicycle which has been found to be  
helpful to inexperienced riders.

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However, I have discovered that such prior art trainer wheel also hinder the development of the riders sense of balance and confidence in riding. This is because the trainer wheels are rigid and the inexperienced rider soon learns to  
5 ride along with one of the trainer wheels always in contact with the ground and hence the bicycle on a slant. Also, such trainer wheels tend to cause the drive wheel of the bicycle to rise off the ground when riding over obstacles such as curbs and the like. This usually causes the rider to fall off the  
10 bicycle. Still further, the prior art trainer wheels tend to cause the drive wheel to lose traction in sand and the like.

As a consequence of the above a person who has learnt to ride with trainer wheel still finds it difficult to make the transition to riding the bicycle without trainer wheels. That  
15 is, these prior art trainer wheels tend to defeat their own purpose.

It is known to provide spring biased trainer wheels which have a hinge in the "L" shaped bracket and a spring disposed to inhibit tilting of the bicycle. These trainer wheels have  
20 wheels which are intended to remain in contact with the ground all the time, but to allow tilting of the bicycle to a limited extent so that the rider can learn about balance and therefor more quickly graduate to being able to ride without the trainer wheels. Such trainer wheels are exemplified by US Patents  
25 5,100,163 (Egley), 5,064,213 (Storch), UK Patent 541,145 (Westcott), European Patent Applications 0127425 (Tsuchie), 0494652 (Weber), and German Patents 378108 (Morgan), 378263 (Atlantic-Akt-Ges Fur Automobilbau) and 438407 (Munsch).

A disadvantage of prior art spring biased trainer wheels  
30 is that the amount of force applied by the spring is limited to the amount of compression or extension of the spring which can occur. That is, a large compression or extension is required for a large increase in the force provided by the spring. Some prior art trainer wheels have attempted to meet  
35 this disadvantage by allowing for variation in a pre-bias of the spring. However, this still does not allow for relatively large changes in the force which resists tipping of the bicycle, it only provides for a stiffer trainer wheel arrangement which then tends to lead to the same problems as

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the original rigid type trainer wheels.

I have achieved this in the present invention by using a block of resilient material in the corner of the "L" shaped bracket so that relatively large changes in the resisting force  
5 provided by the block are achievable.

#### SUMMARY OF THE INVENTION

Therefore it is an object of the present invention to provide a cushioning means for articulated members which is relatively inexpensive and of simple design.

10 In accordance with one aspect of the present invention there is provided a cushioning means for articulated members having a first member articulated to a second member, the cushioning means having:

a resilient member shaped to locate between the first and  
15 the second member proximate their region of articulation and located to opposingly engage the first and the second members so as to provide a bias to resist hinging of the first member towards the second member for cushioning the movement of the second member with respect to the first member.

20 In accordance with another aspect of the present invention there is provided an auxiliary support wheel for a bicycle, the auxiliary support wheel comprising:

a first member adapted for attachment to one side of the bicycle;

25 a second member articulated to the first member at one end by an articulation, the second member being provided with an idler wheel at an outer end thereof for being in contact with the ground during riding of the bicycle, the second member being disposed laterally from the bicycle so that the idler  
30 wheel can provide additional stability to the bicycle when in a substantially upright position; and,

a resilient member shaped to locate between the first and the second member proximate their region of articulation and located to opposingly engage the first and the second members  
35 so as to provide a bias to resist hinging of the second member towards the first member for cushioning the movement of the second member with respect to the first member, the resilient member allowing limited angular movement of the second member with respect to the first member when the second member is

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subjected to a load applied thereto from the idler wheel.

In accordance with a further aspect of the present invention there is provided a bicycle having an auxiliary support wheel according to the preceding aspect of the invention.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Exemplary embodiments of the present invention will now be described with reference to the accompanying drawings in which:-

10 Figure 1 is a front view of an auxiliary support wheel in accordance with one embodiment of the present invention;

Figure 2 is a fragmentary side view of the auxiliary support wheel of Figure 1;

15 Figure 3 is a front elevation of another embodiment of the auxiliary support wheel of the present invention;

Figure 4 is a side view of the auxiliary support wheel of Figure 3;

20 Figure 5 is a schematic front view of a wheelchair incorporating a cushioning member in accordance with the present invention;

Figure 6 is a schematic side view of a front wheel of the wheelchair of Figure 5 incorporating a cushioning member in accordance with the present invention;

25 Figure 7 is a schematic perspective view of a rickshaw incorporating a cushioning member in accordance with the present invention;

Figure 8 is a schematic perspective view of a vehicle trailer suspension incorporating a cushioning member in accordance with the present invention;

30 Figure 9 is a schematic front view of the suspension system of the vehicle trailer of Figure 8;

Figure 10 is a schematic side view of a bicycle incorporating a cushioning member in accordance with the present invention;

35 Figure 11 is a schematic side view of another bicycle incorporating a cushioning member in accordance with the present invention;

Figure 12 is a schematic side view of a bicycle seat incorporating a cushioning member in accordance with the

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present invention;

Figure 13 is a schematic front view of a light aircraft whose undercarriage incorporates a cushioning member in accordance with the present invention.

5        DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

In Figures 1 and 2 there is shown an auxiliary support wheel in the form of a trainer wheel 11 for a bicycle. The trainer wheel 11 comprises a first elongate member 13, a second elongate member 15, an idler wheel 17 and a cushioning member  
10 19.

The first elongate member 13 includes an elongate arm 21 which is U-shaped in cross-section and has a pair of flanges 22a interconnected by a web 22b. The first elongate member 13 also includes a bracket 23 which is attached to one end of the  
15 arm 21 by a nut and bolt arrangement 25 for defining an inner end of the first elongate member 13. The arm 21 has a slot 27 which receives the nut and bolt arrangement 25 to allow adjustment of the position of the bracket 23 along the length of the arm 21.

20        The bracket 23 is disposed transversely with respect to the arm 21 and has an aperture 29 remotely from the arm 21. The aperture 29 permits connection of the bracket 23 to a central bolt of a rear axle of a bicycle. The bracket also has an toe 31 which projects in the opposite direction to the arm  
25 21 for engaging with a hole or indent in the frame of the bicycle to inhibit rotation of the bracket on central bolt of the axle.

In order to fit the bracket 23 to the bicycle, a nut is removed from the central bolt of the rear axle and the bolt is  
30 fitted through the aperture 29. Simultaneously, the toe 31 is positioned into engagement with the frame of the bicycle and the nut is refitted onto the bolt to tighten the bracket 23 in place.

The flanges 22a at other end of the arm 21 remote from the  
35 bracket 23 extend past the web 22b to define a socket 33 in which one end of the second elongate member 15 can be accommodated.

The second elongate member 15 has an elongate arm 35 which is U-shaped in cross-section and tapers from one end 35a to its

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other end 35b. The end 35a is articulated to the end 21a of the arm 21 by a pin 37 extending between the two flanges 22a in the region of the socket 33.

The end 35a has a fluke portion 39 which defines a step  
5 having a face 41 which extends transversely of the arm 35. The fluke portion 39 is disposed within the confines of the socket 33 so that the step face 41 can engage with an inner face of the web 22b to limit the angular movement of the second elongate member 15 with respect to the first elongate member  
10 13.

The end 35b of the arm 35 has a shaft 43 axially connected thereto and about which the idler wheel 17 can freely rotate. The idler wheel 17 is of sufficiently large diameter to elevate the members 13 and 15 from the ground when the member 13 and  
15 15 are at their maximum angle with respect to each other as shown in Figure 1.

The cushioning member 19 is disposed proximate the pin 37 and is in the form of unitary resilient compressible element such as a block 45 of rubber or other resilient material. The  
20 block 45 engages the webs 22b and 35c of the members 13 and 15 respectively. The block 45 is effectively wedged between the members 13 and 15 to bias them towards their maximum respective angular position (at which the step face 41 engages with the inner face of the web 22b). The block 45 is held in position  
25 by a bolt 47 having a bolt stem 49 passing through a central aperture in the block 45 and a nut 51 threaded onto the bolt stem 49 upon a washer 53. The threading of the nut 51 onto the bolt stem 49 causes the block to be clamped into position between the first and the second members 13 and 15. The ends  
30 of the block 45 are chamfered so as to engage with the webs 22b and 35c of the members 13 and 15 respectively.

In use, a pair of the trainer wheels 11 are fitted to the bicycle, one on each side of the rear wheel. The height of the trainer wheels 11 is adjusted by the nut and bolt arrangement  
35 25 to suit the requirements of the rider. For example, the height of the trainer wheels 11 may be adjusted to engage a level portion of the ground simultaneously with the rear wheel of the bicycle. Alternatively, the trainer wheels 11 may be adjusted to be marginally above the level of the ground.



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When mounting the trainer wheels, it is preferable for the first elongate member 13 to project forwardly, thereby disposing the idler wheel 17 towards the front of the bicycle.

When the bicycle is tilted to one side the arm 21 tilts  
5 with the bicycle and the idler wheel 17 engages with the ground to inhibit pivoting of the arm 35 with the bicycle. Consequently, the arm 21 pivots with respect to the arm 35 about the pin 37. This causes a compression of the cushioning member 19 confined between the webs 22b and 35c and by the bolt  
10 47, the nut 51 and the washer 53. Such compression is resisted by the block 45 and hence a torque resisting force is provided which tends to resist tilting of the bicycle and thus provides added stabilising effect to assist inexperienced riders.

Since the block is made from resilient material and  
15 compresses in two zones one either side of the bolt 47 the amount of resistance produced by the block 45 increase rapidly with relatively small pivotal movement of the second member 15 with respect to the first member 13. This in is contradistinction to prior art trainer wheels which rely upon  
20 springs since the springs require a relatively large compression (or extension) to cause a relatively large increase in the force resisting tilting of the bicycle.

I have also discovered that by tilting the first member 13 at an angle to the vertical as shown in Figure 2 the  
25 cushioning member 19 can be made to provide greater resistance to tilting when the bicycle is stationary and less resistance to tilting when the bicycle is moving forward. This occurs because when travelling forward more of the force of the contact of the idler wheel 17 with the ground is transmitted  
30 to the block 45, whereas when the bicycle is stationary only a portion of the tilting force is applied to the block 45 - the rest of the force being applied to the pin 37. This has the effect that the trainer wheels 11 give more support when the bicycle is stationary and less support when the bicycle is  
35 moving at higher speeds. Of course less support is needed at higher speeds since the bicycle develops its own stability due to the centrifugal force of the rotation of the wheels of the bicycle.

In Figure 3 and 4 there is shown a trainer wheel 11' which

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is substantially the same as the trainer wheel 11 and primed reference numerals are used to reference parts of the second embodiment which are the same as those of the first.

The trainer wheel 11' has an arm 21' of the first member  
5 13' formed without the bracket 23. Consequently, the arm 21' is mounted directly onto the central bolt of the rear axle so that the bolt extends through the elongate slot 27'.

The other end of the arm 21' which connects to the articulation is also differently formed. In this respect the  
10 other end of the arm 21' is provided with a pair of lugs 24' which are coextensive with the flanges 22a'. The lugs 24' receive a pair of complementary lugs 36' provided at the corresponding end of the second member 15'.

The second member 15' differs from the second member 15  
15 in a number of respects. Firstly, the second member 15' has its elongate arm 35' is formed so that it is U-shaped at its end 35a' for forming the lugs 36'. Also, at its other end the arm 35' is reversely crimped to form a semi-circular sleeve 38' within which the shaft 43' extends and is supported. Further,  
20 the shaft 43' has its inner end pressed so as to define a flat tab 44' which is fixedly attached by a pin 46' to the underside of the arm 35' intermediate the ends thereof and proximate to the end 35a'. Finally, the bolt 47' differs in that it consists entirely of the bolt stem 49' which is connected and  
25 anchored directly at one end to the pin 37'.

In use, the operation of the trainer wheels 11' is the same as that of the trainer wheels 11 except that the resistance of the block 45' can be adjusted by increasing the pressure on the bolt 47' by threading the nut 51' onto the bolt  
30 stem 49'. This has the effect of increasing the pre-compression of the block 45' by virtue of the larger washer 53'.

Several other embodiments of the present invention are directed towards a cushioning element having general application for articulated members requiring one of the  
35 members to have cushioned movement with respect to the other member. As shown in the drawings, the cushioning member is of a unitary substantially triangular shape comprising a resilient block of rubber of the like held in position between the articulated members by a bolt and nut arrangement in the same

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manner as described hereinabove.

In each case the articulated members are biased apart so that the cushioning member can partially resist and cushion movement of one member towards the other member.

5       The cushioning member has numerous applications in this form, some of which include, use in wheeled vehicles such as for rear and front wheels of wheelchairs as shown in Figures 5 and 6; rickshaws as shown in Figure 7; vehicle trailers and/or caravans as shown in Figure 8 and 9; bicycle frames as shown  
10 in Figures 10 and 11; bicycle seats as shown in Figure 12 and in the suspension systems of light aircraft as shown in Figure 13.

      The cushioning member for an articulated member according to the present invention has the advantage that the cushioning  
15 effect is greater than that achievable with springs and produces greater forces than springs for a smaller relative movement between the two members which are being cushioned. Also, the amount of cushioning can be adjusted by adjusting the tension on the bolt 47'. Further, in relation to use as a  
20 trainer wheel 11 and 11' the tendency to cause stranding of the drive wheel and tipping over of the bicycle at abrupt edges such as curbs and the like is overcome since the trainer wheels 11 and 11' are able to ride up over such obstacles without effecting the angle of disposition of the bicycle. Hence, an  
25 inexperienced bicycle rider can rapidly learn the skills of balance required to ride the bicycle so that the transition to riding without the trainer wheels 11 and 11' is increased. That is, the cushioning member in the trainer wheels overcomes the tendency for inexperienced riders to ride as though the  
30 bicycle is a tricycle having two small outrigger wheels.

      Modifications and variations such as would be apparent to a skilled addressee are considered within the scope of the present invention. For example, the first member 13 could be disposed outwardly from the bicycle and the second member  
35 disposed downwardly and with the idler wheel 17 parallel to the second member 15. Also, an adjustment bolt could be threaded into the end of the arm 35 to allow adjustment of the maximum amount of pivoting of the member 13 and 15 with respect to each other.

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CLAIMS

1. A cushioning means for articulated members having a first member articulated to a second member, the cushioning means having:
  - 5 a resilient member shaped to locate between the first and the second member proximate their region of articulation and located to opposingly engage the first and the second members so as to provide a bias to resist hinging of the first member towards the second member for cushioning the movement of the  
10 second member with respect to the first member.
2. A cushioning means according to Claim 1, in which the resilient member is a compressible block of unitary construction, the block being substantially triangular in shape for engaging between the first member and the second member to  
15 resist their hinging together.
3. A cushioning means according to Claim 2, in which the block is made from rubber.
4. A cushioning means according to Claim 1, in which the resilient member can be pre-biased to provide a force to resist  
20 the hinging together of the first and the second members even when they are at they maximum angle apart.
5. A cushioning means according to Claim 4, in which the pre-bias is effected by a bolt squashing block towards the articulation point of the first and the second members with a  
25 washer.
6. A cushioning means according to Claim 1, also including limit means to limit the amount of pivotable movement of the second member and with respect to the first member.
7. A cushioning means according to Claim 6, in which the  
30 limit means has an adjustment to vary the limit of the pivotable movement of the second member with respect to the first member.

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8. An auxiliary support wheel for a bicycle, the auxiliary support wheel comprising:

a first member adapted for attachment to one side of the bicycle;

5 a second member articulated to the first member at one end by an articulation, the second member being provided with an idler wheel at an outer end thereof for being in contact with the ground during riding of the bicycle, the second member being disposed laterally from the bicycle so that the idler  
10 wheel can provide additional stability to the bicycle when in a substantially upright position; and,

a resilient member shaped to locate between the first and the second member proximate their region of articulation and located to opposingly engage the first and the second members  
15 so as to provide a bias to resist hinging of the second member towards the first member for cushioning the movement of the second member with respect to the first member, the resilient member allowing limited angular movement of the second member with respect to the first member when the second member is  
20 subjected to a load applied thereto from the idler wheel.

9. An auxiliary support wheel according to Claim 8, in which the first member is disposed at an angle to the vertical so that the resilient member can be compressed during forward motion of the bicycle as well as when the bicycle is stationary  
25 so as to provide maximum support when the bicycle is stationary and lesser support when the bicycle is moving in a forward direction.

10. A bicycle having an auxiliary support wheel comprising:

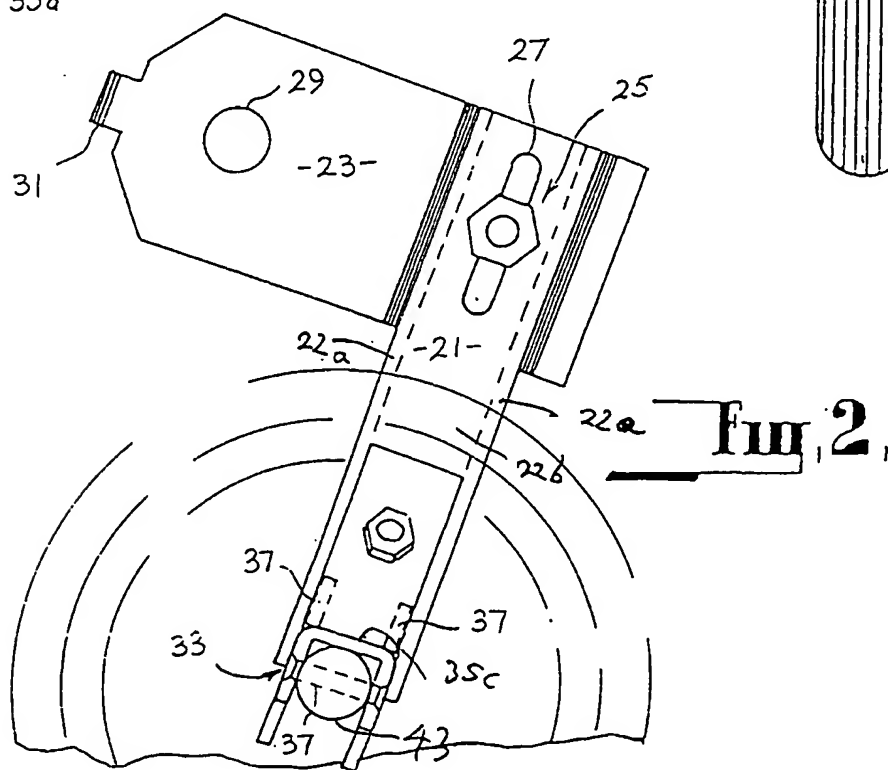
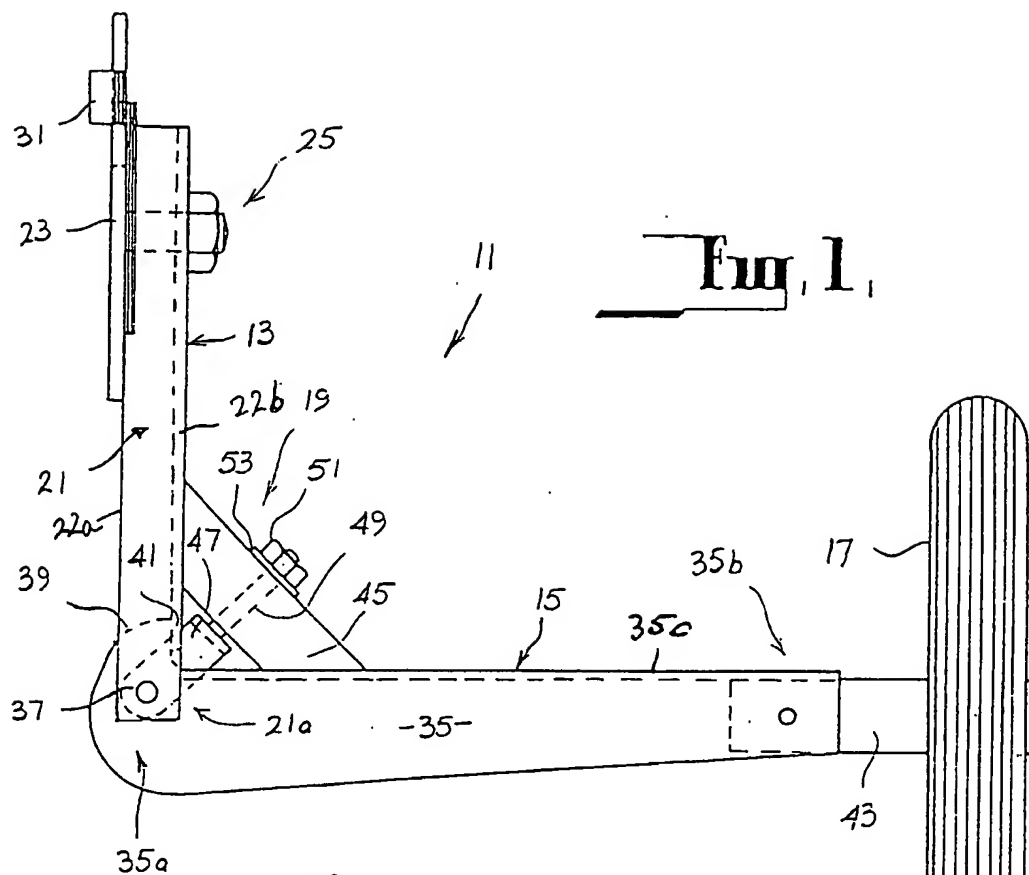
a first member adapted for attachment to one side of the  
30 bicycle;

a second member articulated to the first member at one end by an articulation, the second member being provided with an idler wheel at an outer end thereof for being in contact with the ground during riding of the bicycle, the second member  
35 being disposed laterally from the bicycle so that the idler wheel can provide additional stability to the bicycle when in a substantially upright position; and,

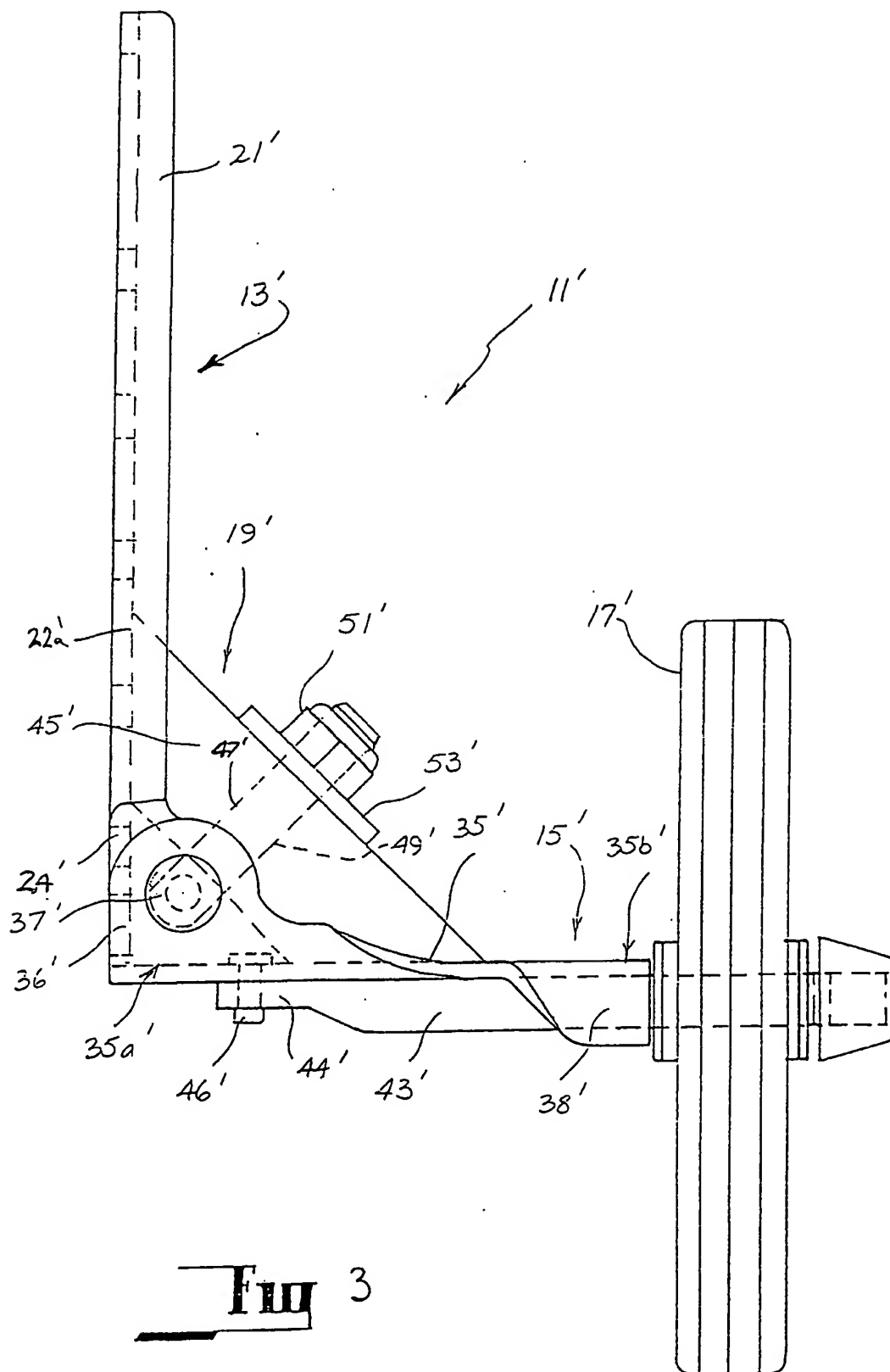
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a resilient member shaped to locate between the first and the second member proximate their region of articulation and located to opposingly engage the first and the second members so as to provide a bias to resist hinging of the second member  
5 towards the first member for cushioning the movement of the second member with respect to the first member, the resilient member allowing limited angular movement of the second member with respect to the first member when the second member is subjected to a load applied thereto from the idler wheel.

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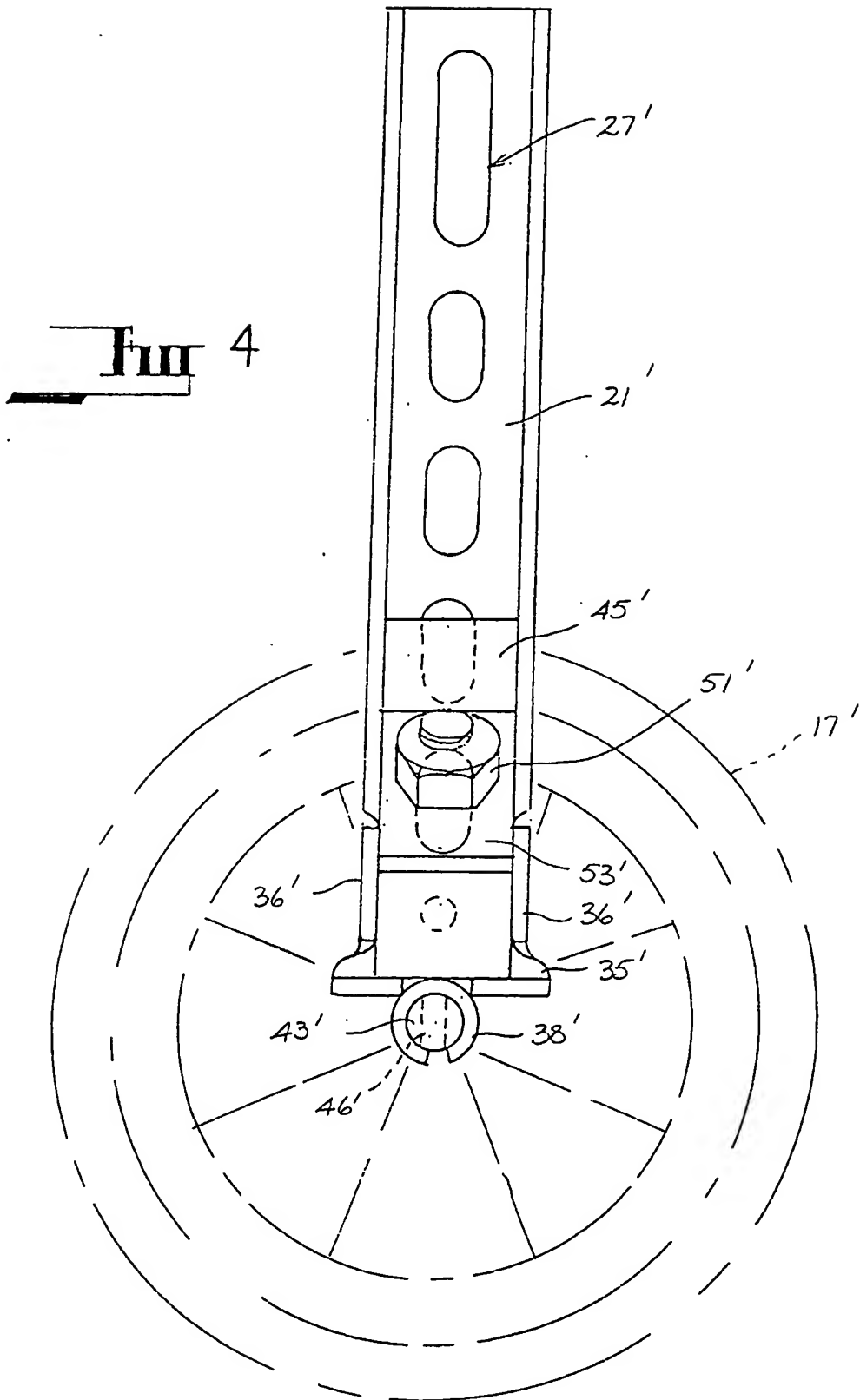


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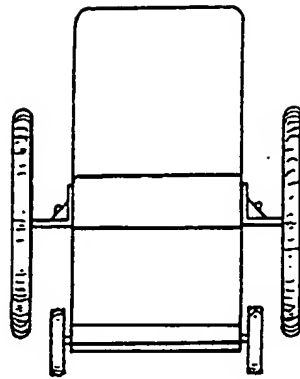


FIG. 5.

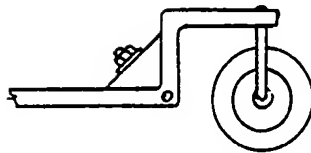


FIG. 6.

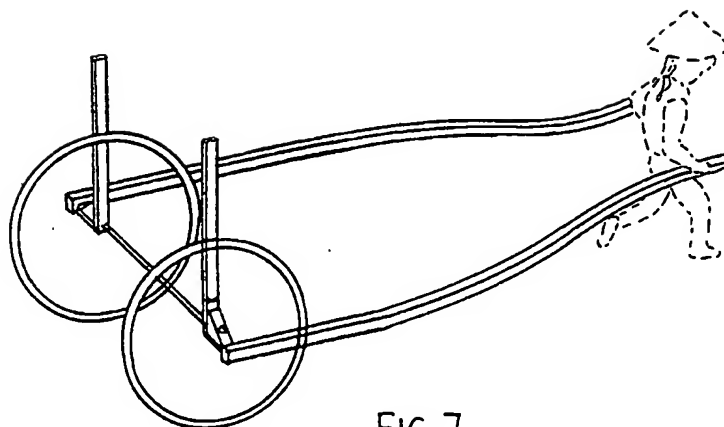


FIG. 7.

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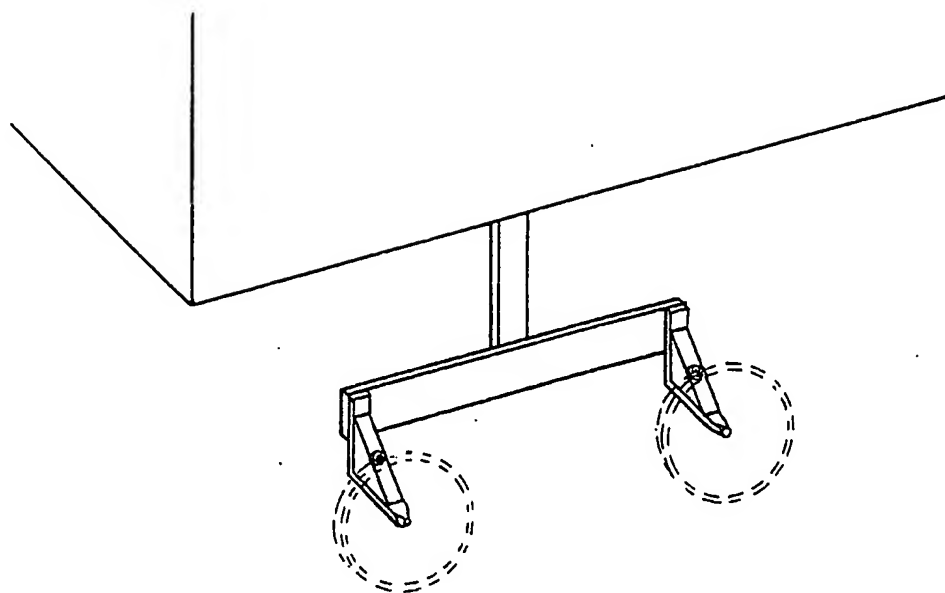


FIG. 8.

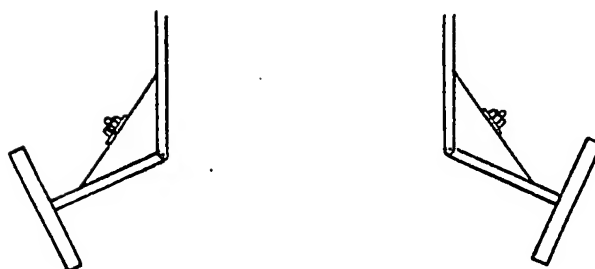


FIG. 9.

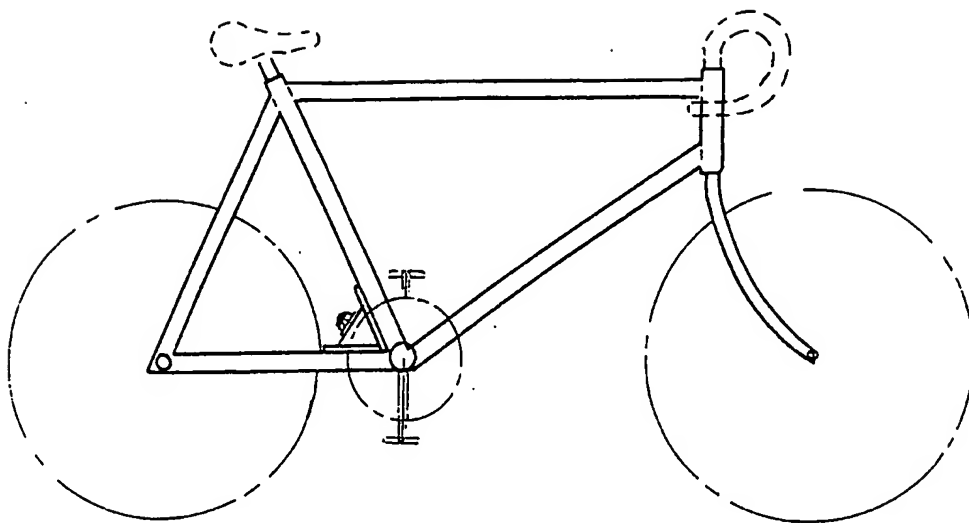


FIG. 10

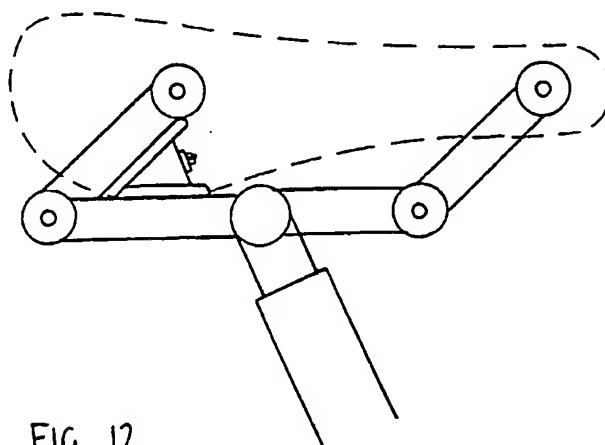


FIG. 12.

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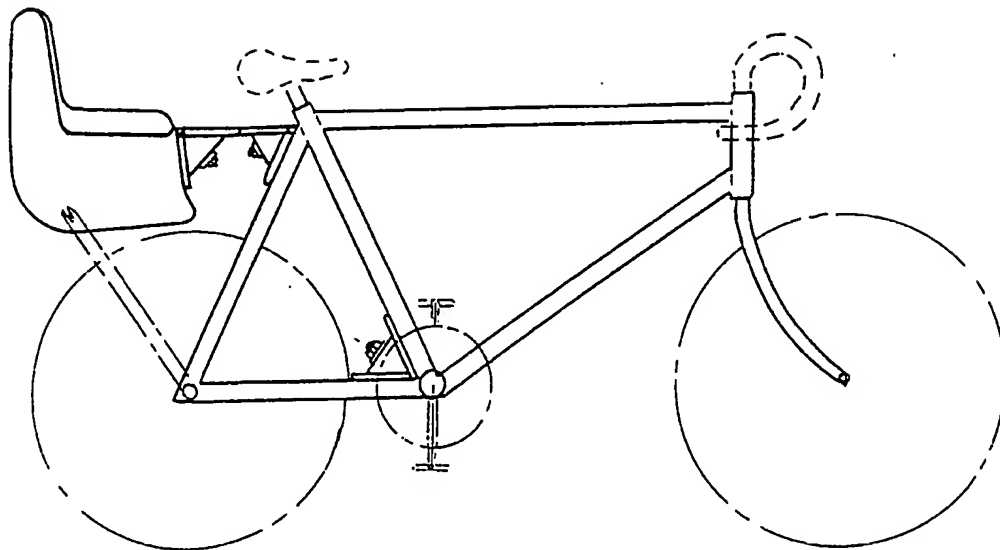


FIG. 11.

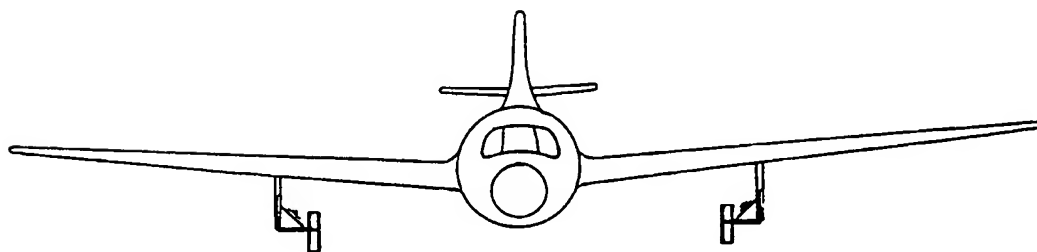
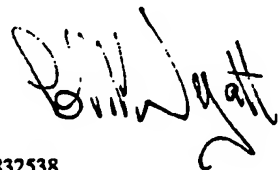


FIG. 13

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> Int. Cl. <sup>6</sup> B62H 1/12, 7/00, B60G 11/22  According to International Patent Classification (IPC) or to both national classification and IPC					
<b>B. FIELDS SEARCHED</b>  Minimum documentation searched (classification system followed by classification symbols) IPC : B62H 1/12, 7/00, B60G 3/08, 11/22  Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU : IPC as above  Electronic data base consulted during the international search (name of data base, and where practicable, search terms used) DERWENT					
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>					
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.			
X	US,A, 5100163 (EGLEY et al) 31 March 1992 (31.03.92) column 3, line 4 - column 4, line 2	1, 4, 6-8, 10			
X	US,A, 5064213 (STORCH) 12 November 1991 (12.11.91) column 4, line 28 - column 5, line 57	1, 4, 8, 10			
X	US,A, 2800320 (JARRET et al) 23 July 1957 (23.07.57) column 1, lines 49-68	1, 4, 6-7			
X	AU,B, 12973/55 (211209) (CROUCHER) 3 May 1956 (03.05.56) page 2, line 25 - page 4, line 14	1, 4, 6-7			
<div style="display: flex; justify-content: space-between;"> <span><input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.</span> <span><input checked="" type="checkbox"/> See patent family annex.</span> </div>					
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Date of the actual completion of the international search 17 February 1994 (17.02.94)	Date of mailing of the international search report 14 Mar 1995 (14.03.95)				
Name and mailing address of the ISA/AU  AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA  Facsimile No. 06 2853929	Authorized officer  <div style="text-align: center;">   <b>C.M. WYATT</b>          Telephone No. (06) 2832538       </div>				

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate of the relevant passages	Relevant to Claim No.
X	GB,A, 2177981 (HEARLWOOD) 4 February 1987 (04.02.87) page 1, lines 20-52	1, 4, 6-7
X	AU,B, 7127/42 (119484) (DUNLOP RUBBER COMPANY LIMITED) 8 February 1945 (08.02.45) column 3, line 13 - column 4, line 23	1, 6
X	US,A, 3895819 (WILLETTS) 22 July 1975 (22.07.75) column 4, lines 14-61	1, 6

## INTERNATIONAL SEARCH REPORT

### Information on patent family members

International application No.

**PCT/AU 94/00606**

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member			
US	3895819	US	3767222	US	3856325
END OF ANNEX					



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